Lower Colorado River Multi-Species Conservation Program

Balancing Resource Use and Conservation

Hart Mine Marsh

2013 Annual Report

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

January 2018

Work conducted under LCR MSCP Work Task E09

Lower Colorado River Multi-Species Conservation Program Steering Committee Members

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U.S. Fish and Wildlife Service
National Park Service
Bureau of Land Management
Bureau of Indian Affairs
Western Area Power Administration

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Lower Colorado River
Multi-Species Conservation Program

Hart Mine Marsh

2013 Annual Report

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ACRONYMS AND ABBREVIATIONS

BLRA	California black rail (*Laterallus jamaicensis coturniculus*)
cfs	cubic feet per second
Cibola NWR	Cibola National Wildlife Refuge
CLRA	Yuma clapper rail (*Rallus longirostris yumanensis* [also known as Yuma Ridgway's rail = *R. obsoletus yumanensis*])
CRCR	Colorado River cotton rat (*Sigmodon arizonae plenus*)
DO	dissolved oxygen
dS/m	decisiemens per meter
EC_e	electrical conductivity
FY	fiscal year
HMM	Hart Mine Marsh
LCR	lower Colorado River
LCR MSCP	Lower Colorado River Multi-Species Conservation Program
LEBI	western least bittern (*Ixobrychus exilis hesperis*)
NGVD27	National Geodetic Vertical Datum of 1927
NGVD29	National Geodetic Vertical Datum of 1929
pH	potential of hydrogen
Reclamation	Bureau of Reclamation
SpCond	specific conductivity
USFWS	U.S. Fish and Wildlife Service

Symbols

>	greater than
<	less than
µS/cm	microsiemens per centimeter
%	percent

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1.0 INTRODUCTION

The purpose of this annual report is to summarize all activities that have occurred at Hart Mine Marsh (HMM) from October 1, 2012, through September 30, 2013, Federal fiscal year (FY) 2013. Water usage is presented for the calendar year, January 1 through December 31, 2013, consistent with water accounting reporting.

1.1 Background

HMM was a decadent wetland on the U.S. Fish and Wildlife Service's (USFWS) Cibola National Wildlife Refuge (Cibola NWR). The channelization of the lower Colorado River (LCR) in the vicinity of HMM caused a drop in the water table, and the marsh became disconnected from the former flood plain. The river's hydrograph has been altered so that it no longer has large, dynamic overbank flow events that would have likely created and maintained HMM. Subsequently, the marsh was reduced to a much smaller area of open water and emergent vegetation (approximately 20 acres). The surrounding areas were colonized primarily by saltcedar (*Tamarix* sp.) an invasive, non-native species. For years, the remaining marsh was characterized by poor water quality, marginal wetland/marsh habitat, and saline soils, which included some areas completely devoid of vegetation. In addition, the design of the marsh's infrastructure and the way it was managed may have contributed to the decadent state of the marsh by increasing concentrations of salinity and nitrogen.

Surface water inputs to HMM after the channelization of the LCR were supplied from three main sources: Arnett (drainage) Ditch, the refuge's Unit 2 irrigation ditch, and tributary inflows from adjacent alluvial fans. During this period of management, the surface water hydrology of the marsh was highly dependent upon irrigation practices in adjacent farming areas and episodic precipitation events in the uplands. Additionally, all three surface water sources terminated in the marsh, with only limited surface water outflows (Hautzinger et al. 2007).

Prior to restoration activities, there was little existing marsh cover type (open water and emergent vegetation) occupying this site. The majority of the site (80%) was dominated by various classes of saltcedar associations. A portion of the 646 acres defined as the Hart Mine Marsh Management Unit was selected for establishment as a Lower Colorado River Multi-Species Conservation Program (LCR MSCP) conservation area. This area now comprises approximately 255 acres designated as the Hart Mine Marsh Conservation Area, referred to hereafter as HMM.

HMM was identified as a site with potential for marsh habitat restoration by the USFWS and Bureau of Reclamation (Reclamation) before the implementation of

the LCR MSCP. The USFWS's Lower Colorado River Refuges Comprehensive Management Plan and Ecological Assessment also targeted HMM as a restoration priority (USFWS 1993). In the mid-1990s, a number of improvements were made, which included the extension of Arnett Ditch past the Hart Mine Marsh Management Unit with the installation of a controlled outflow through the tie-back levee and a series of control structures along this ditch extension. These control structures were designed to allow for drain water from Arnett Ditch to be diverted into the Hart Mine Marsh Management Unit).

With the authorization of the LCR MSCP and the mutual desire for the USFWS and Reclamation to restore HMM, a partnership between the two agencies was formed. As part of the planning effort for the restoration partnership at HMM, the USFWS hosted a Wetland Review at the Cibola NWR. The participants in the review prepared a draft document that included a number of desired features and approaches for restoration of the site – many of which could be incorporated into a restoration design (these are discussed in more detail in the Hart Mine Marsh Conservation Area Restoration Development and Monitoring Plan [LCR MSCP 2009]). Using baseline information gathered and complied by the USFWS, in the Hart Mine Marsh – Existing Conditions Report (Hautzinger et al. 2007) and guided in part by the wetland review process, Reclamation developed an appropriate engineering design and approach that was intended to fulfill both the needs of the Cibola NWR and those of the LCR MSCP.

2.0 CONSERVATION AREA INFORMATION

2.1 Purpose

The purpose of this project is to restore portions of HMM to functional habitats that support species covered under the LCR MSCP, specifically the Yuma clapper rail (*Rallus longirostris yumanensis* [also known as Ridgway's rail = *R. obsoletus yumanensis*]), western least bittern (*Ixobrychus exilis hesperis*), and the Colorado River cotton rat (*Sigmodon arizonae plenus*). It is likely that the creation of a mosaic of marsh habitat will also benefit a host of other species, including the California black rail (*Laterallus jamaicensis coturniculus*), as well as other wading birds and migratory waterfowl.

2.2 Location

HMM is located in Reach 4, south of Blythe, California. It is within the historic flood plain of the LCR and between River Miles 90 to 93 on the Arizona side (figures 1, 2, and 3).

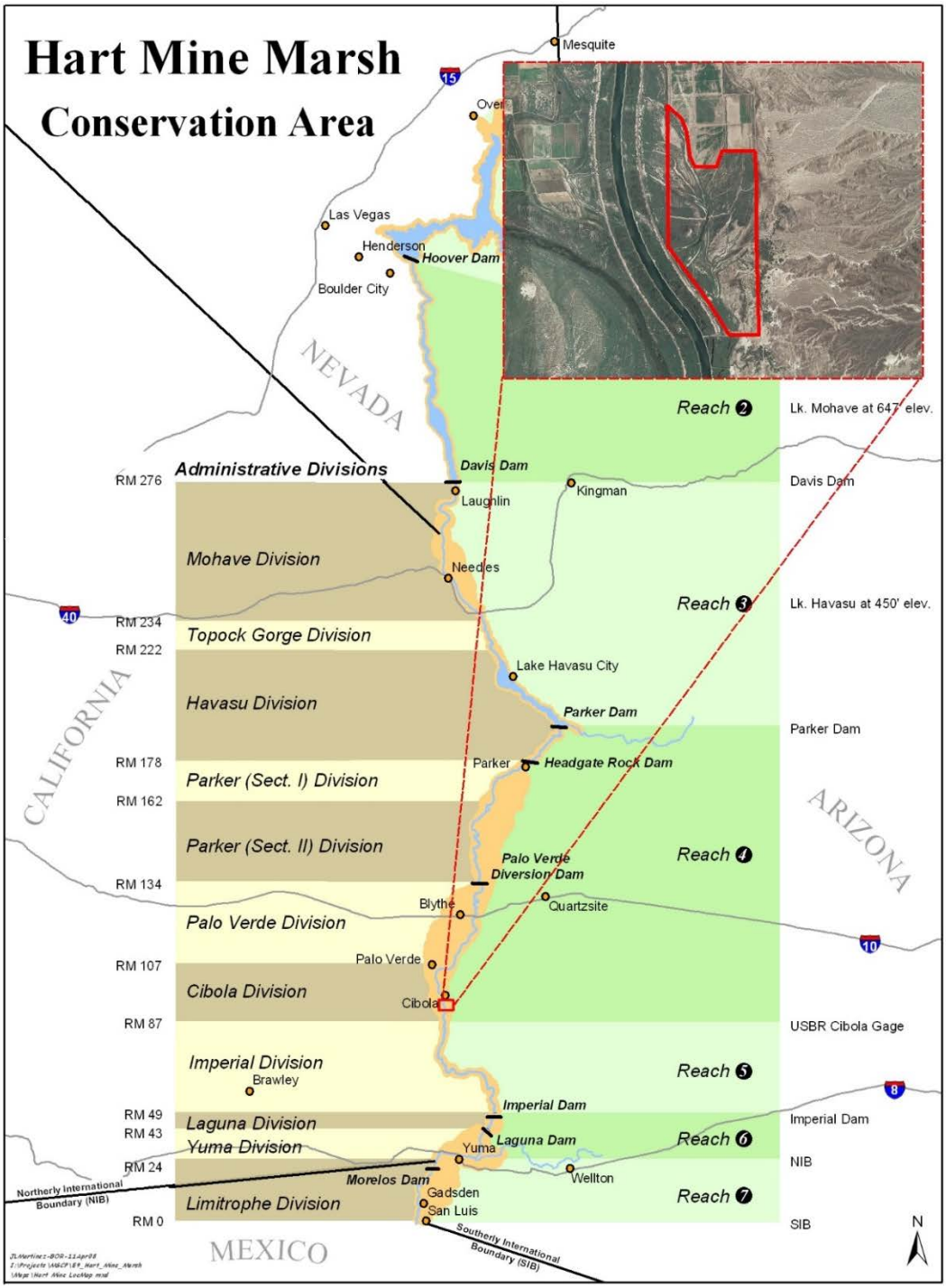

Figure 1.—General location of the Hart Mine Marsh Conservation Area.

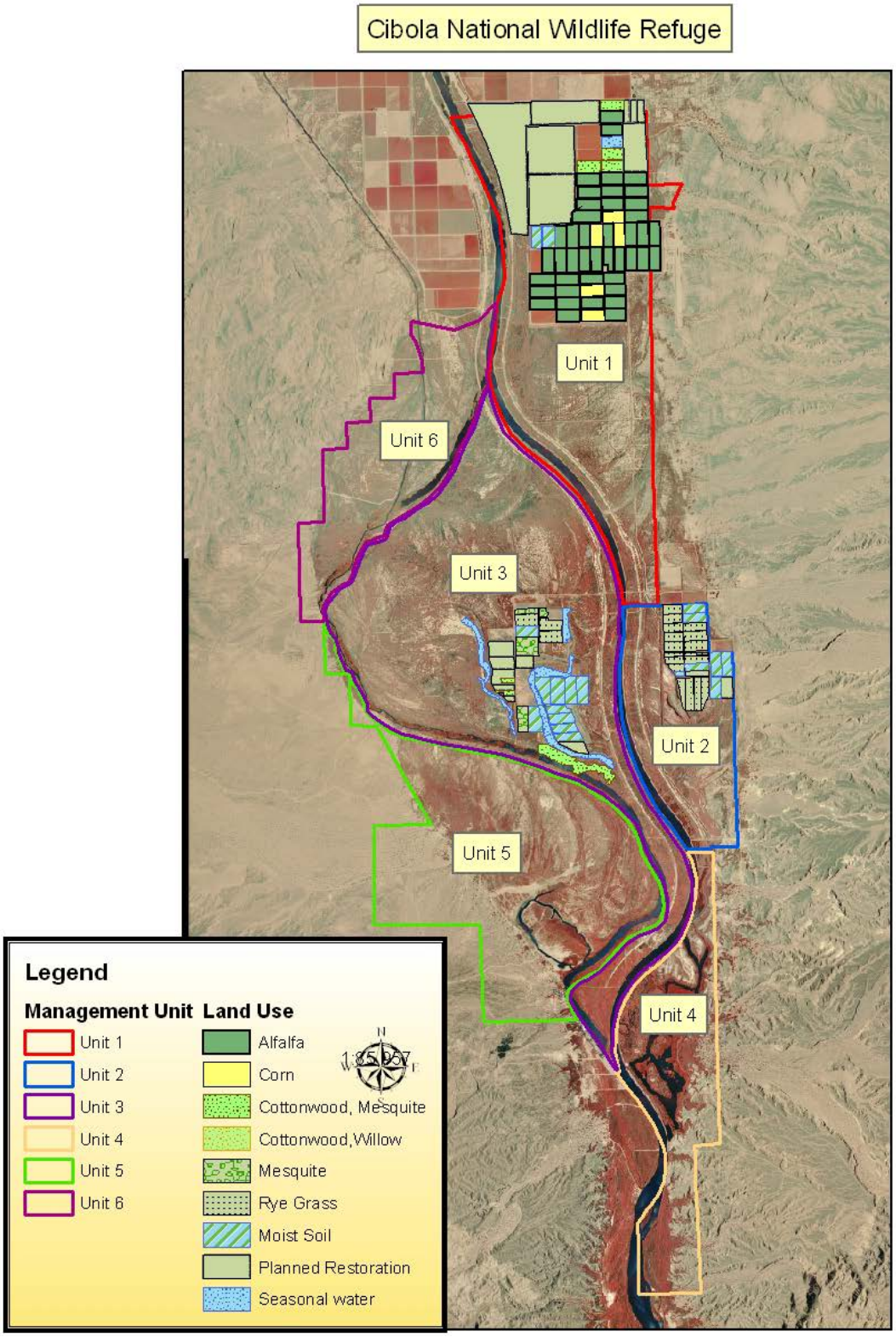

Figure 2.—Cibola NWR's six management units.

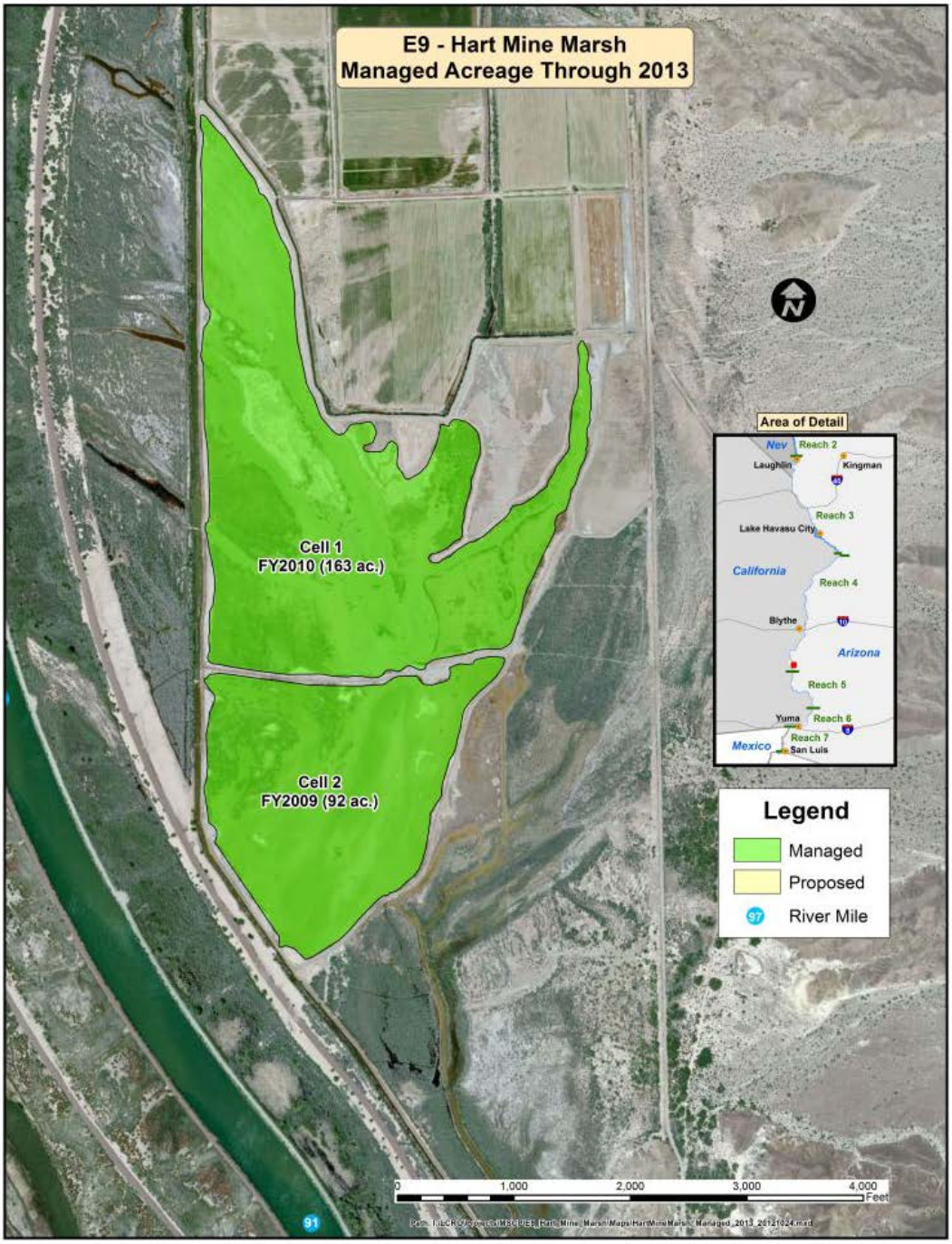

Figure 3.—Managed acres of HMM through 2013.

2.3 Landownership

The property is owned by the USFWS, who has dedicated land and water to Reclamation to develop and maintain native land cover types for the LCR MSCP.

2.4 Water

HMM receives water from the Cibola NWR's second priority water entitlement granted by the 1964 Supreme Court Decree in *Arizona* v. *California* and by U.S. Department of the Interior Secretarial Reservation. This includes a diversionary entitlement of 27,000 acre-feet per year and a consumptive use entitlement (diversion minus return flow) of 16,793 acre-feet per year. In addition, the refuge has a circulatory (circulation water with minimum consumptive use) water right of 7,500 acre-feet per year. The 174-acre HMM will receive an average of 1,258 acre-feet per year (7.23 acre-feet per acre, per year) when the conservation area has been fully developed.

2.5 Agreements

A Land Use Agreement was signed in 2007 by Reclamation and the USFWS to secure land and water for HMM for the remainder of the 50-year LCR MSCP. The agreement outlines the rights and responsibilities of each partner in the project's development and maintenance.

2.6 Public Use

Public use on HMM is managed by the USFWS. In cooperation with Reclamation, the USFWS coordinates its public use and related activities so they are compatible with management of the site for LCR MSCP. Duck hunting is permitted at HMM from 10 a.m. to 3 p.m. during the Arizona State waterfowl season. Other low-impact public uses such as wildlife watching, sport fishing, and education/outreach are expected at HMM. However, these uses may be regulated depending on future occupation of listed species.

2.7 Law Enforcement

Law enforcement activities are performed primarily by the USFWS's Law Enforcement Officer, under the LCR MSCP's site-specific Fire Management & Law Enforcement Strategy (LCR MSCP 2010). Additional local law enforcement assistance is available through the La Paz County Sherrif's Office and the Bureau of Land Management's Yuma Field Office.

2.8 Wildfire Management

The USFWS will provide an appropriate management response to all wildfires that occur within the Cibola NWR. The full range of suppression strategies is available to managers provided that selected options do not compromise firefighter/public safety or cost effectiveness while protecting wildlife habitat (LCR MSCP 2010).

3.0 HABITAT DEVELOPMENT AND MANAGEMENT

3.1 Planting

Marsh habitat for LCR MSCP covered species can be achieved by providing the appropriate combination of emergent vegetation and water depths. At HMM, the design and construction of cells 1 and 2 sought to meet these requirements by providing a variety of water depths without substantially altering the existing natural geomorphic features. In most cases, these features, such as historic river meander scrolls, were incorporated into the design and construction of HMM. The vegetation aspect of this habitat requirement is being achieved through the establishment of native emergent vegetation. This establishment occurs in two ways: through planting desired vegetation species and by natural occupation and colonization of native emergent plant species. Both of these methods are being employed at HMM. Additional transitional and upland plant species are also being used within the boundaries of HMM to stabilize the ground surrounding the marsh cells, inhibit establishment of other invasive species, and to provide a more diverse habitat mosaic to the conservation area.

As part of an effort to increase vegetation species diversity at HMM, supplemental planting occurred in FY13. Additional saltgrass (*Distichlis spicata*) and sacaton (*Sporobolus* sp.) plugs were planted along the margin of the north-eastern side of cell 2 at elevation 217 feet (NGVD29). The saltgrass planted in 2012 and 2013 had high establishment and survival. By the end of the season, the planted marsh species had noticeably filled in and expanded from the planted areas.

Saltgrass and sacaton have been successful in establishing and expanding on the wetted edges of HMM. Because of their effectiveness at preventing the colonization of saltcedar, the LCR MSCP intends to continue to plant saltgrass and sacaton along the margin of the marsh to reduce long-term costs of saltcedar removal (figure 4).

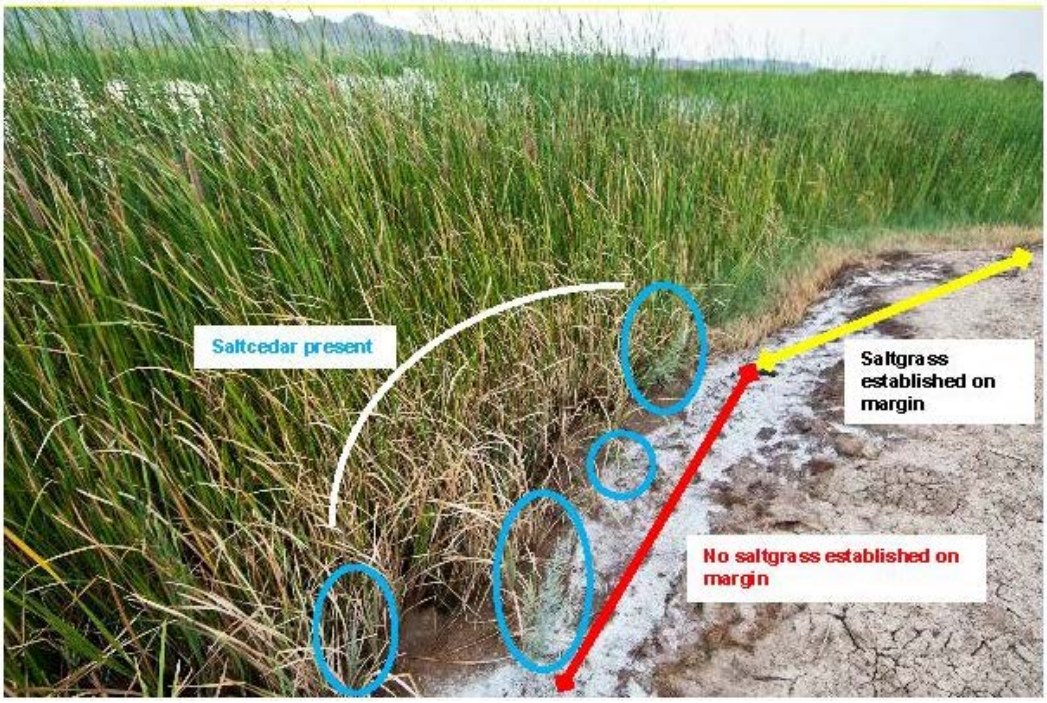

Figure 4.—Noticeable difference in saltcedar presence at the HMM margin with (background) and without established saltgrass (foreground), 2012–13.

In subsequent years, additional marsh and upland plant species may be established within and adjacent to both cells 1 and 2 to fill in non-vegetated areas, stabilize the ground, inhibit invasion of non-native species, and to promote vegetation diversity, as necessary.

3.2 Irrigation

Operation and management of the conservation area primarily relates to the control, manipulation, and management of water on the site. Cells 1 and 2 can be operated independently in terms of surface elevations and inlets and outlets. This is accomplished through a series of gated and/or stoplog-type controls structures located on Arnett Ditch and between the cells. HMM is supplied with water from Arnett Ditch through a series of control structures and by using gravity flow through the marsh cells. Currently, this source of water in Arnett Ditch can also be supplemented with Colorado River water by using the Unit 2 pumps and infrastructure. To provide water for HMM using a source other than the ditch (drain water), the conservation area relies on the water conveyance infrastructure associated with the refuge's Unit 2 management area. This infrastructure includes two electric pumps and a series of buried pipe and concrete-lined supply canals, which is shared by the refuge, contract farmers, adjacent private landowners, and HMM. Currently, the LCR MSCP shares the electrical costs of pumping water through this infrastructure and may also share in the cost of maintenance and

repair to the system as is provided for in the existing Land Use Agreement. Since the completion of Phase 3, Colorado River water, unmixed with drain water from Arnett Ditch, will be able to be supplied to HMM using the Unit 2 delivery canals.

The outlet works for the Hart Mine Marsh Conservation Area also allows for flexibility in where the water exiting the marsh and Arnett Ditch can be discharged. Water draining from the marsh and ditch can be routed through Cibola Lake or directly back to the Colorado River through a pair of gated control structures located along Arnett Ditch south of the Hart Mine Marsh Conservation Area.

3.3 Site Management

Because one of the targeted species for the conservation area is the Yuma clapper rail, water elevations will be strictly controlled in cells 1 and 2. Elevations will be managed in a static condition prior to and during the breeding season for this species. These water surface elevations will be held relatively constant from about March 1 through August 31. The projected managed elevations are 217 and 216.5 feet (NGVD27) for cells 1 and 2, respectively.

Through FY13, both cells 1 and 2 have been managed at 217 feet. This was done primarily to ensure success in establishing planted marsh species and to facilitate water management across the site. Using the available 20-cubic-foot-per-second (cfs) pump, the refuge was able to supplement Arnett Ditch to compensate for high evapotranspiration loss and maintain water levels within 0.2 inch throughout the clapper rail breeding season. The original intent for marsh management in FY11 and FY12 was to slowly draw down cell 2 to reach the target design water surface elevation of 216.5 feet after the clapper rail breeding season had ended and after the installation of the new 40-cfs pump. Unfortunately, the aging water delivery infrastructure, specifically the Unit 2 water delivery lines, could not handle the volume of water generated by the newly installed 40 cfs pump, and it developed substantial leaks. Without an operable 40-cfs pump, having separate water levels for the two cells was deemed too difficult to manage due to the control structure configuration and the volume of water required to manage the cells independently. In order to not overtax the system, the 40-cfs pump was not used until the infrastructure repairs and upgrades were completed in the winter of FY13 or during regular operation in FY11–12.

Based on observations in FY11, it is doubtful that cell 2 will be able to be managed at its target design elevation of 216.5 feet. At elevation 216.5 feet, a large portion of cell 2 would be exposed increasing weed management intensity. In addition, much of the established habitat would be left without standing water,

resulting in the death of much of the planted marsh vegetation. The LCR MSCP expects that a target depth of 216.8 feet may be more practical for sustaining established marsh habitat in cell 2 and for maximizing ideal water depths. Attempts to establish two separate water levels in the marsh cells are expected to commence following the installation of the new Unit 2 water delivery lines in FY13.

Management at HMM also includes the management of water quality parameters. Most of these parameters have not been problematic to date, with the exception of rising salinities throughout the summer months. This has been effectively controlled through regular pumping of Colorado River water into the marsh via Arnett Ditch. Although there appears to be a lag before salinities fall, this method has been able to keep salinities below marsh thresholds (see figure 10). Additional future water management actions to control salinities and long-term salinization may also include the dewatering and flushing (refilling with Colorado River water) of cells 1 and 2. This would also occur outside of the breeding season for Yuma clapper rails and would likely be conducted for one cell at a time to allow some flooded habitats to remain for resident Yuma clapper rails and other species during this management activity.

Long-term management activities may also include the removal of decadent emergent vegetation to improve habitats for Yuma clapper rails. This is also expected to be conducted one cell at a time, with a longer interval between vegetation removal at each cell to maintain usable emergent marsh habitats. Vegetation removal may be accomplished through controlled burning or by mechanical means. This management action is expected to be driven and supported by data from monitoring activities or past relevant research and prescribed using the adaptive management process of the LCR MSCP. An adaptive management plan for the site has been drafted and is currently in review.

The majority of maintenance on the site is expected to be controlling invasive and non-native species invasion. Currently, the majority of this work is being performed through contracted services and will be transferred to a service agreement with the Yuma Area Office in FY14. This has been accomplished by frequent site visits to assess the occupation and spread of weedy species followed by control actions, if necessary. Control is performed using crews that employ hand-pulling of weeds, using mechanical removal techniques, and through limited herbicide treatments, when appropriate. The area that this contract covers includes the perimeter of the entire marsh complex from the wetted edge of the marsh to the tops of the perimeter road surrounding the marsh. The refuge is responsible for the adjacent areas outside the Hart Mine Marsh Conservation Area. Other site maintenance includes the upkeep of access roads and the water delivery infrastructure. Access roads specific to the Hart Mine Marsh Conservation Area will be maintained by the LCR MSCP.

In August 2013, the new HMM 40-cfs pump failed due to sedimentation around the pump intake, causing the pump shaft to break, damaging the motor. This required Reclamation/LCR MSCP to remove, rebuild, and reinstall the 40-cfs pump/motor as quickly as possible to prevent the water level in the marsh from falling below the required water level threshold for a successful marsh habitat. This reinstallation was completed in September 2013, and the 40-cfs pump is continuing to work properly at this time. However, the LCR MSCP and Cibola NWR continue to be concerned about future sandbars/sedimentation from the Colorado River infiltrating both (20- and 40-cfs) pump intakes and damaging the pumps and motors. The Cibola NWR Unit 2, 20-cfs pump has also suffered damage from the intake of river sedimentation and has been removed for repairs and reinstallation by the USFWS and a cooperative farmer in FY14.

3.4 Major Construction

Major infrastructure repair activities were completed in FY13 and involved the replacement of the leaking water delivery lines from the Unit 2 pumps and the installation of a dedicated water line for HMM (figures 5 and 6). An additional water inlet was also constructed in the northwestern corner of cell 1 to allow pumped (unmixed with drain water) Colorado River water into cell 1 via the Unit 2 irrigation infrastructure. This addition was part of the original plan for HMM; however, due to time and resource constraints, it was not implemented during previous construction phases. The combination of this water inlet and the other upgrades to the water delivery infrastructure at HMM has increased efficiency and flexibility at HMM in terms of water management.

4.0 MONITORING

4.1 Abiotic Monitoring

The USFWS was responsible for monitoring and reporting on many abiotic parameters of the site as part of the interagency agreement with Reclamation. Refuge staff continued monthly water quality monitoring at specific points throughout the marsh. In addition to this monthly monitoring, they also carried out an additional investigation during FY13 (the results are presented in the Hart Mine Marsh Salinity Investigation Report [Stetson Engineers, Inc. et.al 2013]). The primary objectives of this project were to (1) accurately determine and delineate the levels of salinity and selenium in the marsh substrate and in the soils on the perimeter of the marsh, (2) evaluate the risk to the marsh ecosystem under the existing levels of salinity and selenium, and (3) develop a plan for future monitoring to track the salinity and selenium levels in the future.

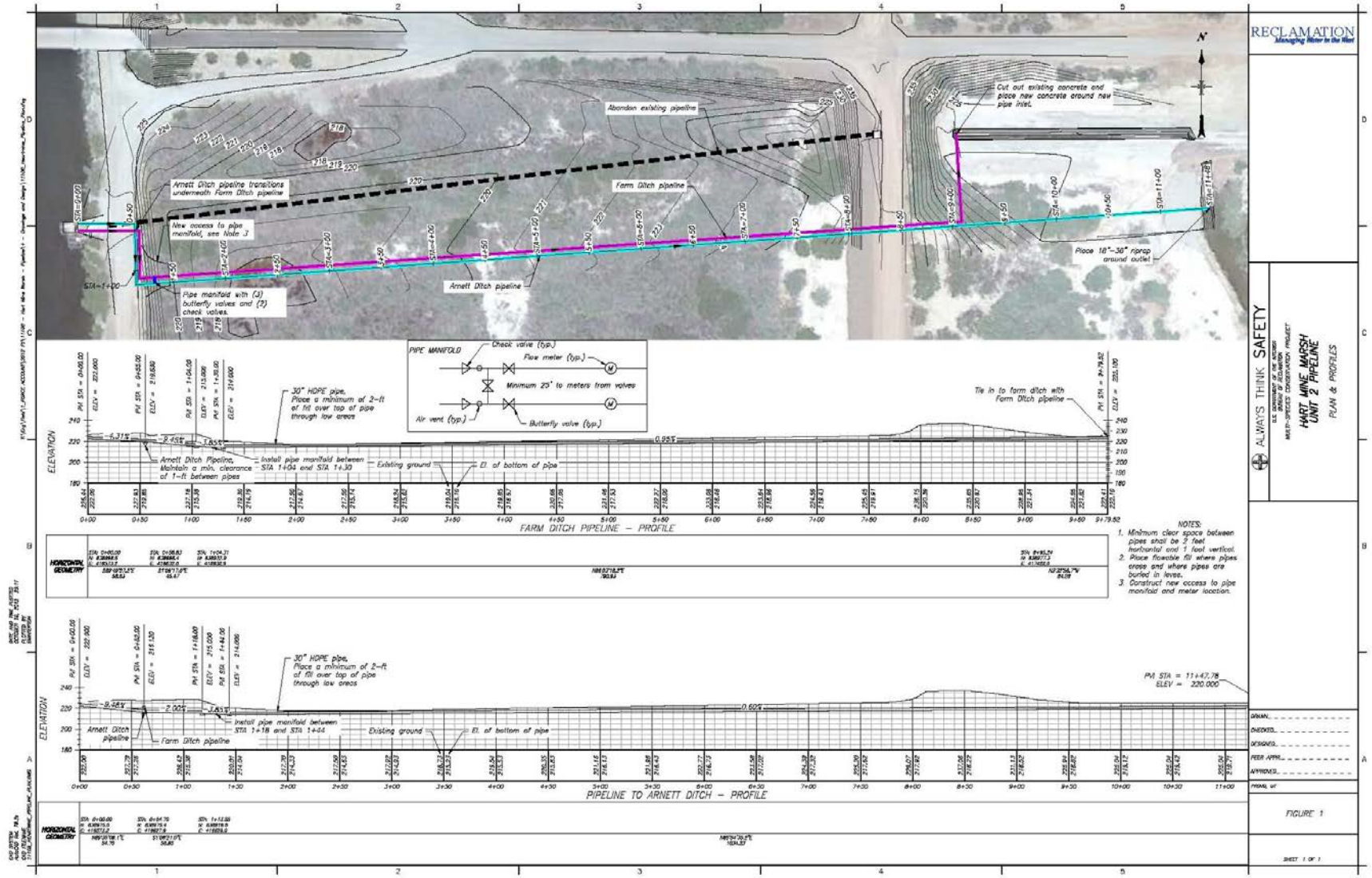

Figure 5.—As-built plan for Unit 2 pipe replacement, including a dedicated line for HMM.

Figure 6.—Ground photo of HMM pipeline replacement in the spring of 2013.

The area was subdivided into three parts due to variable site conditions on the project area: (1) perimeter soils, (2) marsh area with cattails (*Typha* spp.), and (3) marsh area with open water. A separate analysis was completed for each of these subdivided areas and figure 7 presents the map of soil salinity distribution across the entire project area (measured by electrical conductivity (EC_e).

The salinity levels of the perimeter area soils are highest in the surface and decrease with increasing depth. This is known as an inversed soil salinity profile and is indicative of soil moisture moving upward from the substratum to the soil surface. Over time, salinity levels in the upper part of the soil increase and often salt crusts develop. Since reduction of the level of salts in the perimeter soil areas is not an option, the ability to establish vegetation in these areas is very limited. About 70% of the area has salinity levels > 80 decisiemens per meter (dS/m), and consequently, only about 12% of the perimeter soil area could support saltgrass (or other vegetation) under current conditions.

In contrast with the perimeter soils area, the soil substrate salinity level for the cattail area is lowest in the 0–1 foot layer and highest in the 1-2 foot layer. The upward movement of salts does not occur due to submerged conditions. It is likely that the existing management of the marsh is appropriate for maintaining salinity levels in the marsh substrate; however, it is not possible to draw that conclusion with one set of data. Although salinity levels of the marsh substrate were determined in 2009, the conditions under which that data were collected differ markedly from this study. Therefore, it is not possible to make a direct comparison between the 2009 results and the 2013 results.

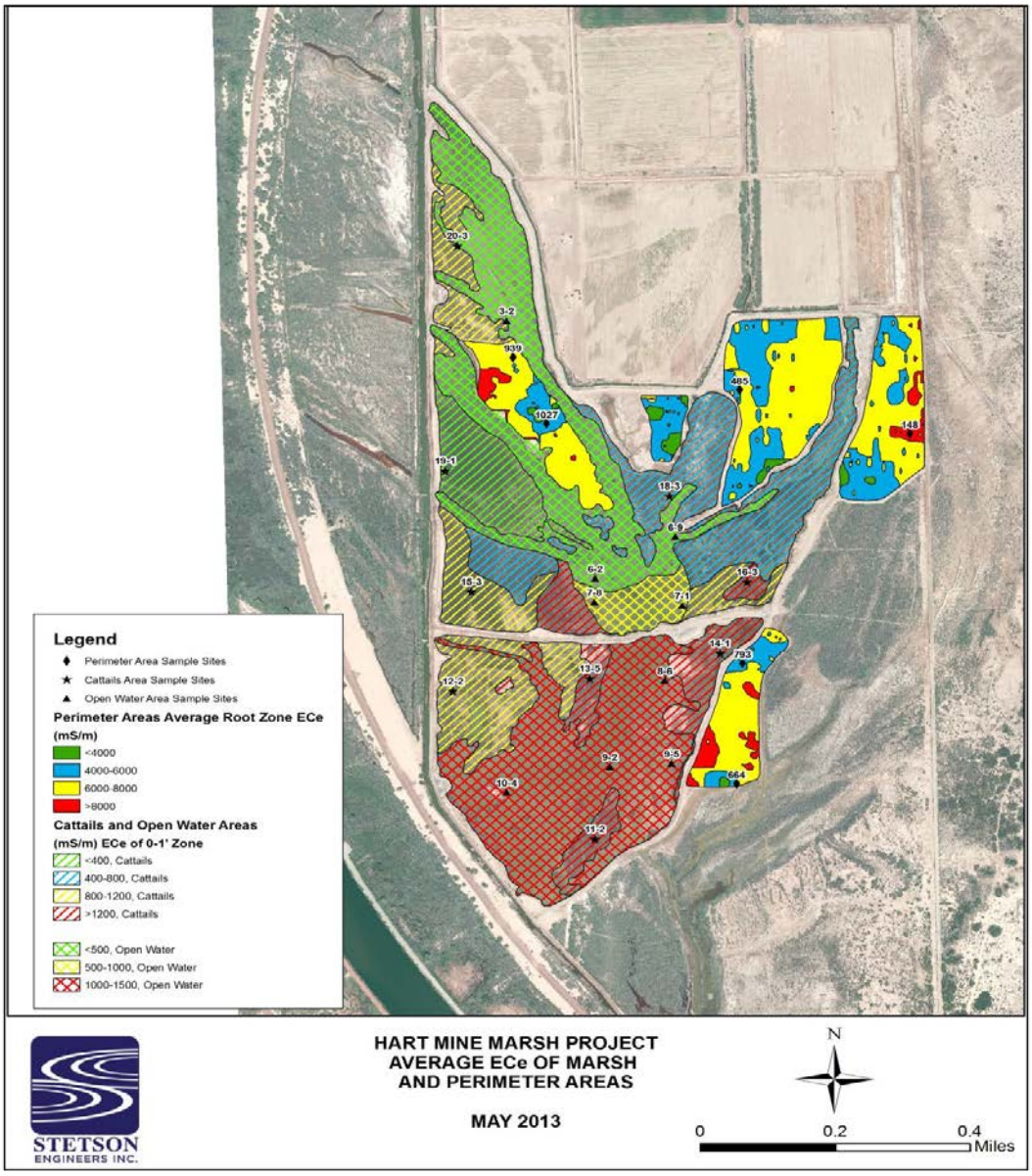

Figure 7.—Hart Mine Marsh – average EC_e of marsh and perimeter soil areas, FY13.

The 2013 Hart Mine Marsh Salinity Investigation Report (Stetson Engineers, Inc., et.al 2013) indicates that the salinity levels of 47% in the cattail area of the marsh are approaching the threshold levels (8–16 dS/m) at which cattail growth would be affected. Yet, because the plants on HMM in the cattail area are under water, the effects of salinity are somewhat mitigated, and the actual salinity value at which cattails may be affected may be higher than 16 dS/m when under flooded conditions. The data also indicate that the soil salinity differs greatly between the ponded areas and exposed soil areas, which would infer that, with a prolonged drop in the water level of the marsh, exposing the shallow flooded areas would induce salinization to levels that cannot be tolerated by cattails.

The salinity levels in the marsh area with open water were much lower than in the perimeter soils and the drained conditions that were measured in 2009. However, it is not possible to make a direct comparison between the salt content of the substrate in the drained condition in 2009 and the substrate in the ponded condition in 2013. The data indicate that 50% of the open water area has a salinity level that approaches the reported tolerance threshold for cattails, although inundation mitigates the salinity effects, and these open water areas do not currently support cattail vegetation.

Salinity levels for both the cattail area and open water area tend to increase toward the southern part of the marsh. The reason for this distribution is not clear, but the fact that it exists is relevant to future management of the marsh. If future revegetation efforts should include plants less tolerant of salinity than cattails, the southern part of the marsh would be difficult to establish. Additionally, any future monitoring program should certainly include sites in this area, as it appears to be at greatest risk of salinization, and it is at or near the tolerance threshold of preferred plants (cattails).

Soil selenium concentrations were tested on the 0–1 and 1–2 foot layers on the six sampled calibration sites. The highest level of test results for soil selenium for all samples tested was 0.097 milligrams/ kilogram, well below the Environmental Protection Agency standards for plants, mammals, soil invertebrates and birds, at the screening stage of an ecological risk assessment.

The 2013 report also provides soil salinity monitoring recommendations (every 2–3 years) that will be considered to be implemented in the future management and overall monitoring of the marsh.

Water quality parameters, including dissolved oxygen (DO), specific conductivity (SpCond), and pH (potential of hydrogen), were measured from October 25, 2012, through September 24, 2013. Figure 8 shows the locations (sites) where water quality parameters were measured. In general, water quality varied from site to site and across seasons. Bar graphs that depict the average values for each parameter across the sites relevant to HMM (sites 6–10 and site 15) can be found on figures 9–11. An additional monitoring site (site 15) was added in late FY12 in order to be more representative of the northeastern section of the marsh.

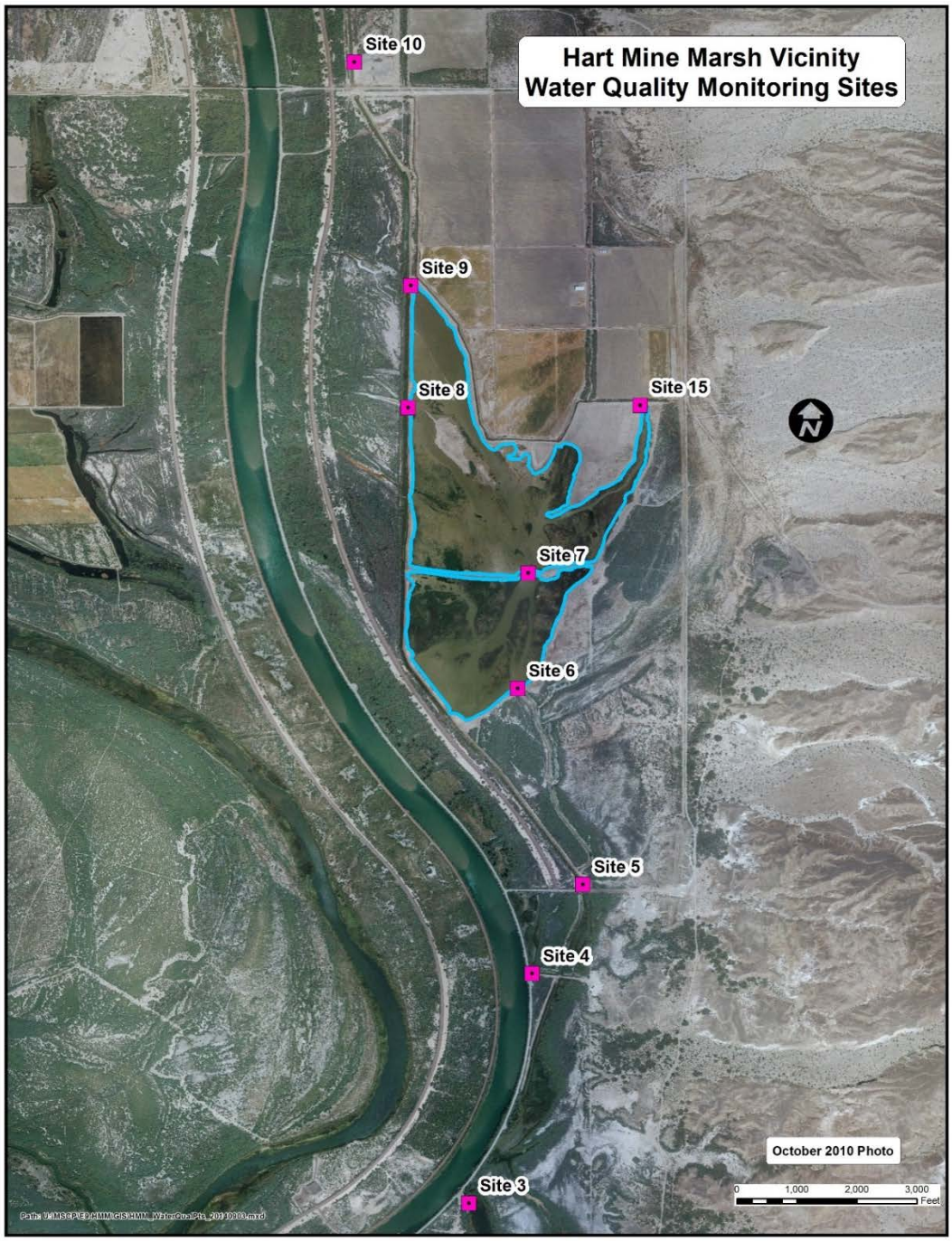

Figure 8.—HMM vicinity – water quality monitoring sites, FY13.

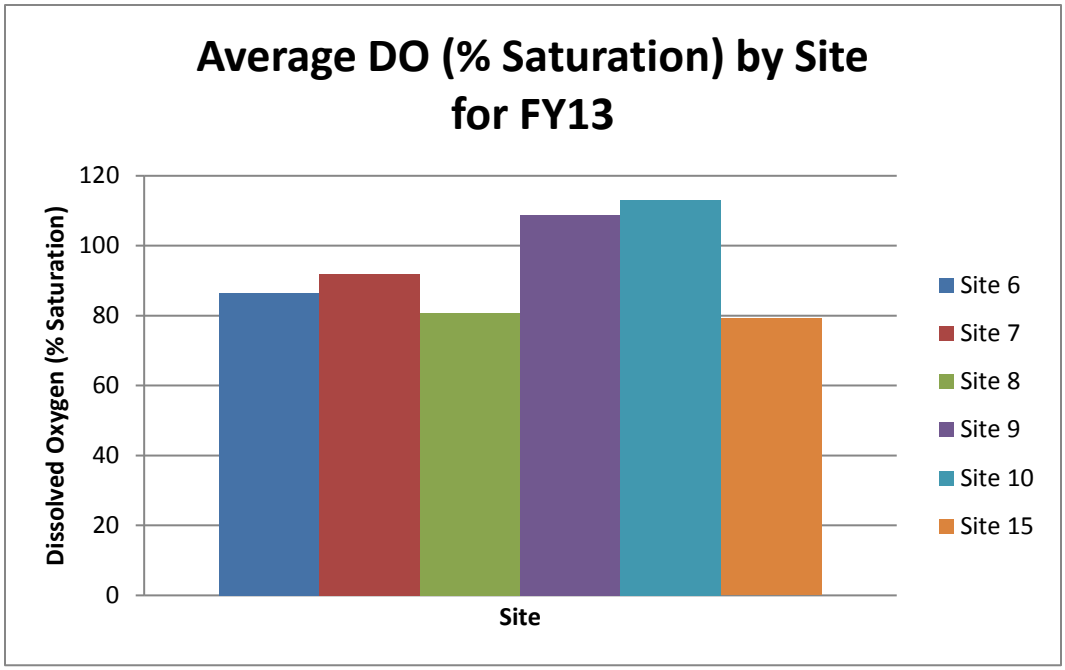

Figure 9.—Average percent saturation of DO at HMM sampling sites 6, 7, 8, 9, 10, and 15, FY13.

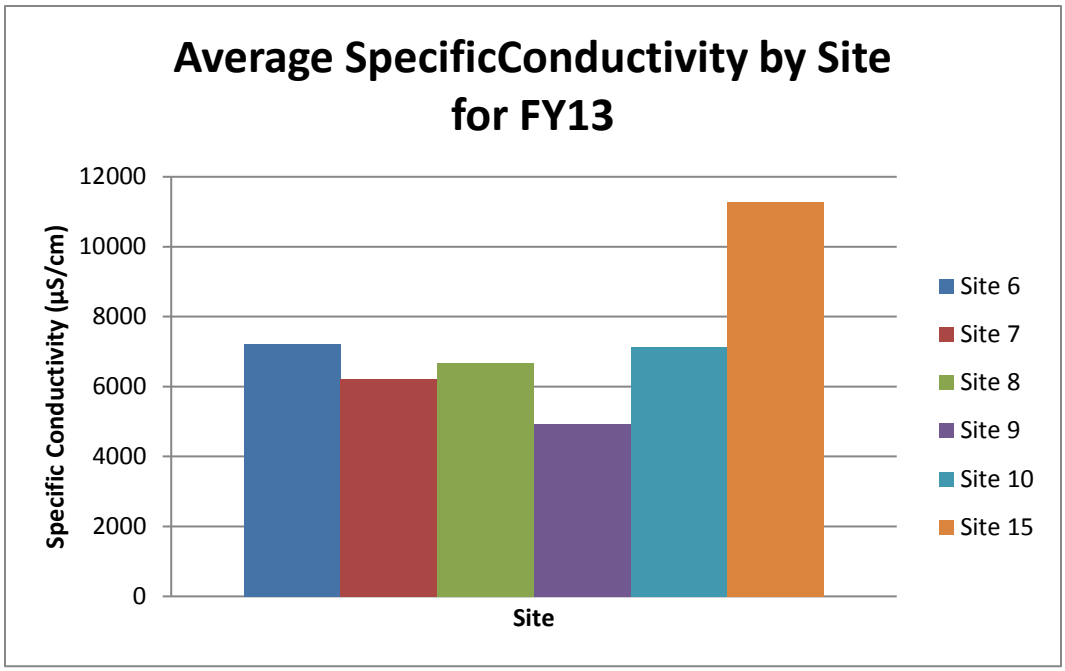

Figure 10.—Average specific conductivity at HMM sampling sites 6, 7, 8, 9, 10, and 15, FY13.

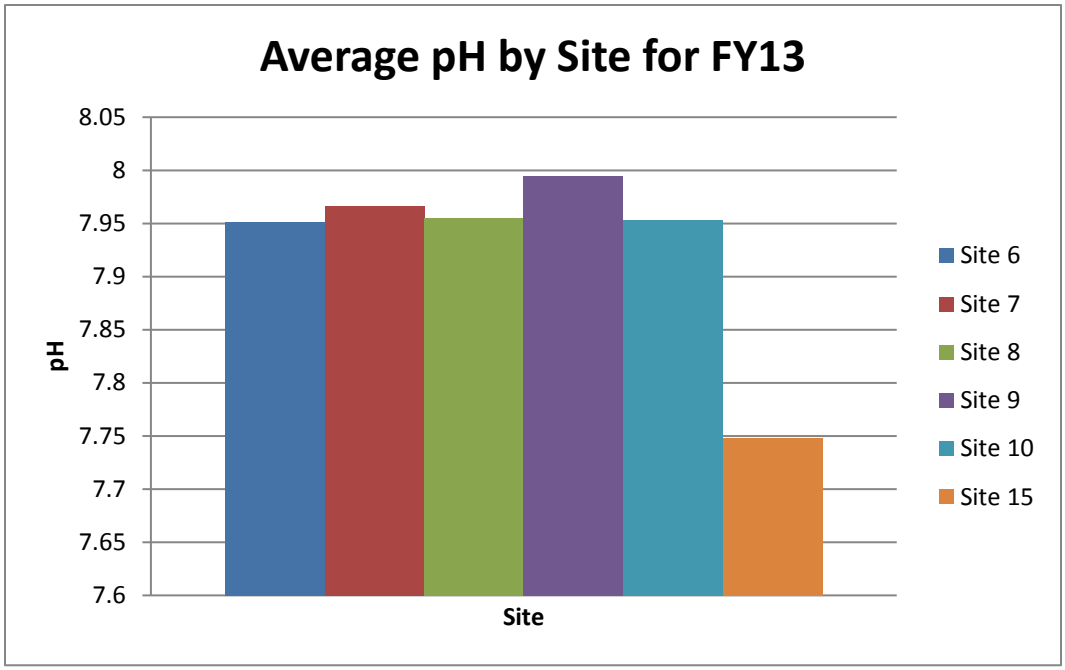

Figure 11.—Average pH at sampling sites HMM 6, 7, 8, 9, 10, and 15, FY13.

Because very high salinities can affect vegetation and, in turn, impact wildlife species, management activities at this time only targeted SpCond as described in section "3.3 Site Management." Salinities were effectively controlled and held below 15,000 microsiemens per centimeter (µS/cm) by pumping Colorado River water into HMM via Arnett Ditch. Figure 12 illustrates the variation in SpCond throughout the year and shows the drop in salinities at most sites when additional fresh water was pumped into the marsh from the Colorado River through the ditch during the summer months, when evapotranspiration increases dramatically. Site 15 is the only site where additional inputs of fresh water did not lower the SpCond as the year progressed. This is most likely due to the location of the site in the northeastern corner of cell 1. Site 15 is located the furthest distance from any of the input points located along Arnett Ditch, which would make it difficult for adequate quantities of low salinity water to reach this location and to lower salinity levels. With the recent infrastructure improvements completed in FY13, lower salinity river water (that has not been mixed with agricultural drain water from Arnett Ditch) will be able to be input at two different points in cell 1, which will help to mitigate elevated (localized and marsh-wide) salinity levels. As abiotic monitoring continues and subsequent management decisions are made based on these data, these additional input points will be considered when determining how to deliver water to HMM.

The DO and pH values recorded at each sampling site through FY13 are included on figures 13 and 14 and show the fluctuations in water quality during the year. A complete water quality dataset for FY13 is available from the LCR MSCP upon request.

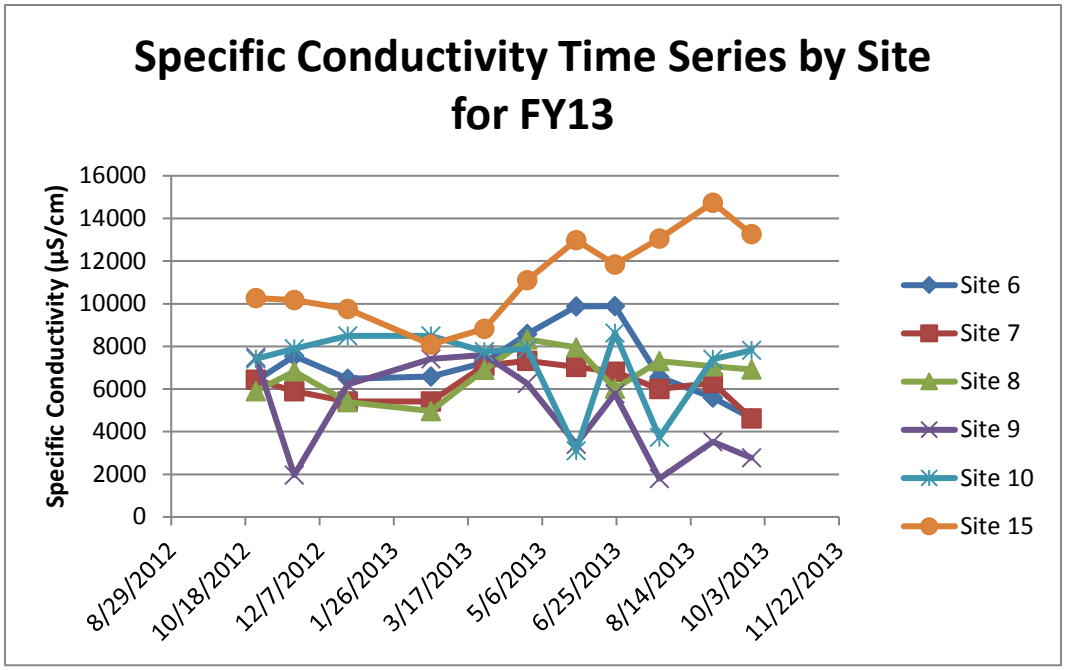

Figure 12.—SpCond at HMM sampling sites 6, 7, 8, 9, 10, and 15, FY 13.

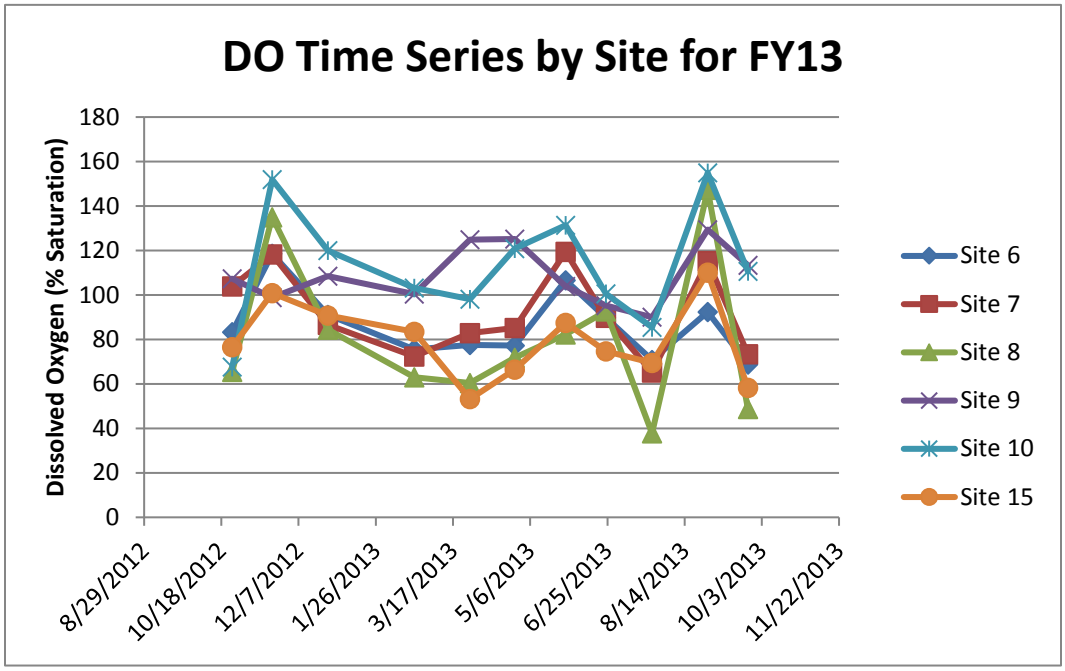

Figure 13.—DO in % saturation at HMM sampling sites 6, 7, 8, 9, 10, and 15, FY13.

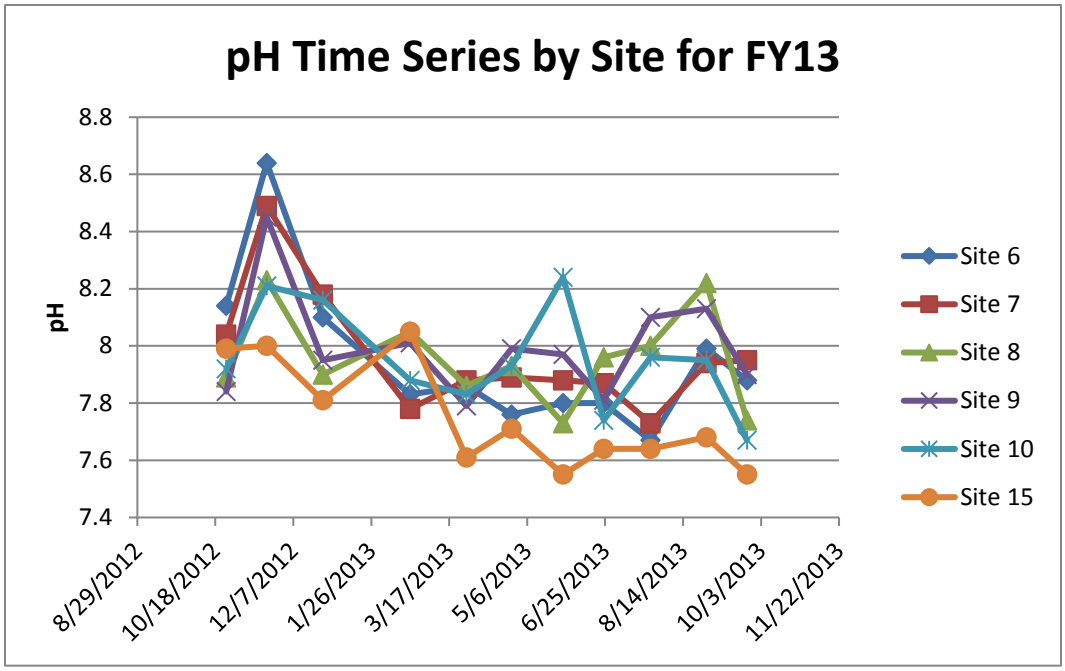

Figure 14.—pH at HMM sampling sites 6, 7, 8, 9, 10, and 15, FY13.

4.2 Avian Monitoring

4.2.1 Marsh Bird Surveys

Three marsh bird surveys were conducted at nine point locations during four different surveys between March and May by the USFWS Lake Havasu Refuge Complex using the National Marsh Bird Monitoring Protocol (Conway 2009). Western least bitterns were detected at four of the nine points and Yuma clapper rails were detected at five of the nine points. Most detections occurred during the second and third surveys (in April) at three of the point locations. No California black rails were observed (Kahl 2015).

5.0 Habitat Creation Conservation Measure Accomplishment

5.1 Vegetation Monitoring

Vegetation monitoring is not conducted for marshes; rather, remote sensing and ArcGIS techniques, as described below, are used to assist in the evaluation of HMM.

5.2 Evaluation of Hart Mine Marsh

The process for habitat creation conservation measure accomplishment was finalized in October 2011 (LCR MSCP 2011). All areas within HMM were designed to benefit covered species at the landscape level.

The water depths are managed during the breeding season for Yuma clapper rails and western least bitterns, and to meet the species conservation measure as defined in the Habitat Conservation Plan. In 2013, the percent of open water and marsh was delineated using aerial imagery in ArcGIS. The marsh continues to fill in the open water as expected by design. Table 1 shows how much habitat is creditable for each of the targeted covered species at HMM. Two species with habitat creation goals have creditable acres at HMM. These species (including their corresponding conservation measure acronym) are the Yuma clapper rail (CLRA1) and western least bittern (LEBI1).

Table 1.—Species-specific habitat creation conservation measure creditable total acres for 2013

Species-specific habitat creation conservation measure	CLRA1	BLRA1	LEBI1	CRCR2
Creditable acres in 2013	0	0[1]	0	0[2]
Total, including previous years	**255**	**0**	**255**	**0**

[1] Reclamation is in the process of determining the land and water interface and the method for delineating California black rail (BLRA) marsh habitat at <1 inch deep. Once this has been determined, HMM will be evaluated.

[2] The preliminary data suggest the Colorado River cotton rat (CRCR) uses both Fremont cottonwood-Goodding's willow (*Populus fremontii-Salix gooddingii*) and fringe marsh habitats. Reclamation is in the process of evaluating data collected to determine marsh and cottonwood-willow habitat uses by the CRCR.

6.0 ADAPTIVE MANAGEMENT

Adaptive management relies on the initial receipt of new information, the analysis of that information, and the incorporation of the new information into the design and/or direction of future project work (LCR MSCP 2007). Under the Adaptive Management Program, conservation areas will be assessed for biological effectiveness and whether they fulfill the conservation measures outlined in the Habitat Conservation Plan for 26 covered species and if they potentially benefit 5 evaluation species. Post-development monitoring and species research results will be used to adaptively manage conservation areas after initial implementation. Once monitoring data are collected over a few years, and then analyzed for HMM, recommendations may be made through the adaptive management process for site improvements in the future. Currently, there are no adaptive management recommendations for HMM.

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